

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 32

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MASAYOSHI IKEDA

Appeal No. 2001-1512
Application No. 09/273,541¹

HEARD: JUNE 11, 2002

Before KRASS, BARRETT, and SAADAT, Administrative Patent Judges.
SAADAT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the Examiner's final rejection of claims 4 and 5, which are all of the claims pending in this application.

We reverse.

¹ Application for patent filed March 22, 1999, which is a divisional of Application 08/976,041, filed November 21, 1997, now abandoned, which claims the foreign filing priority benefit under 35 U.S.C. § 119 of Japanese Application No. 09-54116, filed February 21, 1997.

BACKGROUND

Appellant's invention is directed to a method of assessing substrate temperature controllability in a substrate processing apparatus. An inert cooling gas such as helium (He) is supplied to a gap between the substrate and an electrostatic chucking stage, which functions as a heat transfer gas and maintains the substrate temperature constant during processing (specification, page 2). In contrast with the conventional method of controlling the cooling gas pressure by opening and closing a bypass valve, Appellant's invention controls the pressure by a flow rate based on the difference between a measured pressure and a set value (specification, page 7). The flow rate value corresponds to the extend the cooling gas leaks out from the gap between the substrate and the chucking stage (specification, page 13) and indicates unsatisfactory state of chucking when the amount of leakage is high (specification, page 14).

The only independent claim is reproduced as follows:

4. A method of assessing a substrate condition of a substrate, comprising the steps of:

delivering a heat transfer gas to a control device including an exhaust valve and a pressure control valve;

supplying a set pressure value to the pressure control valve;

closing the exhaust valve so that all of the heat transfer gas passing the pressure control valve is delivered to a gap between the substrate and a substrate mounting surface of a substrate holder;

measuring the pressure of the heat transfer gas which is flowing in the gap between the substrate and the substrate mounting surface of the substrate holder;

supplying the measured pressure to the pressure control valve;

automatically controlling the flow rate of the heat transfer gas with the pressure control valve on the basis of a difference between the set pressure value and the measured pressure such that the measured pressure of the heat transfer gas becomes equal to the set pressure value and the flow rate corresponds to a leakage rate of the heat transfer gas; and

assessing a state of the gap between the substrate and the substrate mounting surface on a basis of a comparison of the heat transfer gas flow rate with a standard value.

The prior art references of record relied upon by the Examiner in rejecting the appealed claims are:

Tezuka	4,771,730	Sep. 20, 1988
White	5,822,172	Oct. 13, 1998
		(filed Jan. 7, 1997)

Claims 4 and 5 stand rejected under 35 U.S.C. § 103 as being unpatentable over Tezuka in view of White.

We make reference to the answer (Paper No. 26, mailed November 7, 2000) for the Examiner's complete reasoning in support of the rejection, and to the brief (Paper No. 25, filed

October 4, 2000) and the reply brief (Paper No. 28, filed January 2, 2001) for Appellant's arguments thereagainst.

OPINION

To address the language of independent claim 4, the Examiner relies on the teachings of Tezuka (col. 2, lines 35-44) describing the delivery of a heat transfer gas to the interface between the work [substrate] and the electrostatic chuck (final rejection, page 2).² The Examiner reasons that while Tezuka does not specify closing the exhaust valve, the reference teaches controlling of the cooling gas pressure by observing gage 19 and manipulating valves 16 and 17 (col. 4, lines 44-47) and therefore, would operate if the exhaust valve is closed (id.). The Examiner also points to the teaching of Tezuka related to control of flow rate and concludes that the "correspondence of the flow rate to a leakage rate is inherent in this measurement since the flow rate is claimed to be controlled only by pressure measurement methods" (final rejection, page 3).

The Examiner further relies on White for teaching the assessment of a state of the gap between the substrate and the chuck by monitoring a different effect other than comparing the

² Paper No. 15, mailed April 4, 2000.

heat transfer gas flow rate with a standard valve (final rejection, pages 3 & 4). The Examiner supports this conclusion by further stating (id.) that:

Although White et al. teaches monitoring a different effect of the separation, one of ordinary skill would have realized that any of the effects taught by White et al. could be monitored and the apparatus of Tezuka already has a pressure gauge and automatic control valve. [Emphasis added.]

Appellant argues that the mere fact that Tezuka may possibly be operative with a closed exhaust valve and that the reference inherently discloses the closing of the exhaust valve is based on speculations unsupported by the disclosure of Tezuka or the knowledge of one of ordinary skill in the art (brief, pages 12 & 13 and reply brief, pages 2-4). Additionally, Appellant argues that controlling the cooling gas pressure of Tezuka would not lead one of ordinary skill in the art to close the variable valve 17 (brief, page 14 and oral hearing). Appellant further characterizes the Examiner's reasoning that in the absence of teaching away from closing the exhaust valve, Tezuka must teach the closing of the exhaust valve, as improper shifting the burden to Appellant to prove the contrary (brief, page 15).

Additionally, Appellant asserts that White does not disclose or suggest automatically controlling gas flow rate for assessing the gap between the wafer and the chuck (brief, page 17).

Appellant argues that White merely detects separation between a wafer and the chuck by monitoring the current flow into the electrostatic clamp (id.). In particular, Appellant points to the constant cooling gas flow rate of White and indicates that there would be no reason to assess the state of the gap based on comparing the measured gas flow rate with a standard value (brief, page 18 and reply brief, pages 5-8).

In response, the Examiner indicates that absent contrary teachings in Tezuka, one having average skill in the art would have understood the term "manipulating" to include "setting the valve to any and all positions available to the valve, including open, closed, and all positions in between" (answer, page 3). With respect to the teachings of White, the Examiner further asserts that White provides reasons for monitoring incorrect alignment that includes "prevention of excessive outgassing into the chamber and accurate positioning of the substrate wafer" (answer, page 5).

In rejecting claims under 35 U.S.C. § 103, the Examiner bears the initial burden of presenting a prima facie case of obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). The conclusion that the claimed subject matter is obvious must be supported by evidence, as shown

by some objective teaching in the prior art or by knowledge generally available to one of ordinary skill in the art that would have led that individual to combine the relevant teachings of the references to arrive at the claimed invention. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Our reviewing court requires this evidence in order to establish a prima facie case. In re Piasecki, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed. Cir. 1984); In re Cofer, 354 F.2d 664, 668, 148 USPQ 268, 271-72 (CCPA 1966). However, "the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion." In re Lee, 277 F.3d 1338, 1344, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002).

A review of Tezuka reveals that the reference relates to a vacuum processing apparatus in which a heat transfer gas is introduced in the gap between an electrostatic chuck and a substrate placed on the chuck (col. 2, lines 35-44). We find that Tezuka provides the cooling gas to the gap at a desired flow rate. The specific passage in Tezuka that relates to controlling of the pressure of the cooling gas (col. 4, lines 44-47), as relied upon by the Examiner and argued by Appellant, states that:

The pressure of this cooling gas is controlled at a specific desired value by observing the indication of the pressure gage 19 and manipulating the flow rate control valve 16 and the variable valve 17.

Thus, both valves 16 and 17 are constantly adjusted to control the flow rate at a desired level that shows on gage 19. However, we find nothing in Tezuka that teaches or suggests that the exhaust valve (variable valve 17) is closed after the cooling gas is delivered to the gap between the substrate and the chuck. In fact, both valves 16 and 17 are manipulated to maintain the flow of the cooling gas at a specific rate. The reference contains no teaching or suggestion of "closing the exhaust valve so that all of the heat transfer gas passing the pressure control valve is delivered to a gap between the substrate and a substrate mounting surface of a substrate holder," as recited in Appellant's claim 4. Although variable valve 17 may be capable of being closed at some point while the gas pressure is being controlled, the Examiner does not point to a specific suggestion or reason, and we do not find any in Tezuka to that effect, for closing the variable valve 17 after delivering the cooling gas. See In re Mills, 916 F.2d 680, 682, 16 USPQ2d 1430, 1432 (Fed. Cir. 1990) ("While Mathis' apparatus may be capable of being modified to run the way Mills' apparatus is claimed, there must be a suggestion

or motivation in the reference to do so."). See also In re Fritch, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992), citing In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) ("The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification").

Moreover, to assert that the cooling gas flow rate inherently corresponds to the leakage rate at the wafer-chuck interface when valve 17 is closed, places the initial burden on the Examiner to establish that "the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by person of ordinary skill." In re Robinson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-1951 (Fed. Cir. 1999), citing Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1269, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991) (inherency may not be established by probabilities or possibilities or by the mere fact that a certain thing may result for a given set of circumstances). In this case, we agree with Appellant that both valves 16 and 17 are manipulated or continuously controlled (brief, page 14), since the Examiner provides no showing that

valve 17 is closed and the gas flow rate necessarily corresponds to the leakage rate at the wafer-chuck interface.

Turning now to White, we find that the reference is directed to a similar vacuum processing apparatus that includes an electrostatic chuck and a cooling gas flowing in the gap between the wafer and the chuck. However, as also indicated by Appellant (brief, page 18), White introduces a constant flow of cooling gas at the interface between the workpiece (wafer) and the platen (chuck) having a controlled flow rate of approximately 0.25 sccm (col. 5, lines 16-20). White's constant flow rate of the cooling gas is comparable to Tezuka's desired flow rate which is indicated by pressure gage 19. We further find that White teaches that the tightness of contact between the wafer and the chuck may be compromised if the wafer is separated from the chuck due to incorrect placement of the wafer or the presence of particles (generated from the process) landing on the chuck (col. 10, lines 20-44). White also indicates that such separation decreases capacitance between the wafer and the electrode on the chuck and causes the current flow to the electrodes of the electrostatic chuck be reduced (id.). Therefore, White keeps the cooling gas flow at a constant level without corresponding the flow rate to the leakage rate from the gap between the wafer and

the chuck. White, in fact, assesses the state of the placement of the wafer or separation of the wafer from the chuck by measuring a reduction in the electric current flow not by the difference between the flow rate of the cooling gas and a predetermined value.

Assuming, arguendo, that it would have been obvious to combine White's method of assessing the wafer-chuck contact by measuring the current with the apparatus of Tezuka, as held by the examiner, Tezuka would still not disclose the claimed steps of closing the exhaust valve so that all of the cooling gas passing through valve 16 is delivered to the gap between the wafer and the chuck. In that regard, Tezuka only supplies what appears to be a constant flow of cooling gas controlled by manipulating two valves while White monitors changes in the gap between the wafer and the chuck by measuring the current flow to the electrostatic chuck. Accordingly, as the Examiner has failed to establish a prima facie case of obviousness, the rejection of claim 4, as well as claim 5 which depends therefrom, under 35 U.S.C. § 103 over Tezuka and White is not sustained.

CONCLUSION

In view of the foregoing, the decision of the Examiner rejecting claims 4 and 5 under 35 U.S.C. § 103 is reversed.

REVERSED

ERROL A. KRASS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
LEE E. BARRETT)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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